N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

A  \[\rightarrow\]  B
Pressure  \[\rightarrow\]  Ulcer

Multicausality

Years smoking  \[\rightarrow\]  Heart disease
High fat diet  \[\rightarrow\]  Heart disease
Limited exercise  \[\rightarrow\]  Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study
- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Is the primary purpose examination of relationships?

No

Descriptive Design

Yes

Will the sample be studied as a single group?

No

Correlational Design

Yes

Quasi-Experimental Study

Is the treatment tightly controlled by the researcher?

No

Will a randomly assigned control group be used?

No

Is the original sample randomly selected?

Yes

Experimental Study

Yes
Selecting a Descriptive Design

Examing sequences across time?

No

Comparative Descriptive Design

One Group?

No

Cross-sectional design

Yes

Descriptive Design

Data collected across time

No

Studying events partitioned across time?

No

Trend Analysis

Yes

Repeated measures of each subject

Yes

Longitudinal Study

No

Case Study

Following same subjects across time?

Yes

Single unit of study

Cross-sectional design with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

- **Clarification** → **Measurement** → **Description** → **Interpretation**

  - **Phenomenon of Interest**
    - Variable 1
    - Variable 2
    - Variable 3
    - Variable 4

  - **Description**
    - Description of Variable 1
    - Description of Variable 2
    - Description of Variable 3
    - Description of Variable 4

  - **Interpretation of Meaning**
    - Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Group II
{variables measured}

Describe

Interpretation of Meaning

Development of Hypotheses
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Research Design

Control Group?

- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Comparison with population values?
        - No
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
            - Yes
              - Compare treatment & control conditions?
        - Yes
          - Repeated Measures?
            - No
              - One group pretest/post-test design
            - Yes
              - No
                - Yes

Selecting The Type of Experimental Design

- **Pretest**
  - **No**
    - Post-test only control group design
  - **Yes**
    - **Repeated Measurements?**
      - **No**
        - Examine effects of confounding variables?
          - **No**
            - Multiple sites?
              - Pretest/post-test control group design
          - **Yes**
            - Blocking?
              - Randomized block design
      - **Yes**
        - Repeated measures design
        - Examination of complex relationships among variables in relation to treatment
    - Randomized clinical trials
    - Comparison of multiple levels of treatment
    - Nested Designs
# Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:**
Yourself (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing: Mortality
- Instrumentation: Restricted generalizability as control increases
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
## Nested Design

<table>
<thead>
<tr>
<th>Pain Control Management</th>
<th>Primary Nursing Care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary Care</td>
</tr>
<tr>
<td>Traditional care</td>
<td>Unit A</td>
</tr>
<tr>
<td>PRN Medication</td>
<td>Unit A</td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
</tr>
</tbody>
</table>

Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design